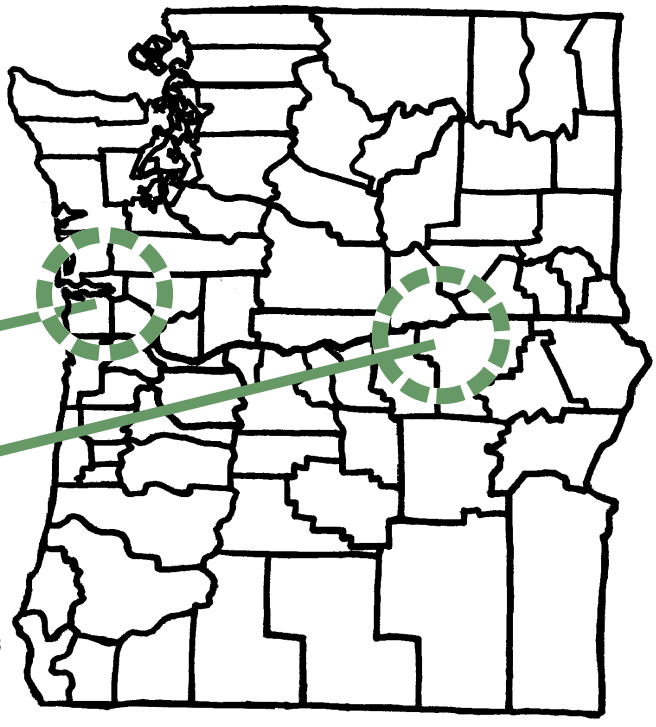
Crop Profile for
Hybrid Poplars
in Washington & Oregon

Production Facts

- Approximately 45,000 acres are currently used for production of hybrid poplars in Oregon & Washington, with projections of over 50,000 acres within the next few years. (Current estimates including Idaho and British Columbia total 55,000 to 60,000 acres.)
- Approximately 3,000 acres are harvested each year for pulp with an estimated value of $8.1 million. The harvested acreage is expected to double in the next few years.
- Production costs west of the Cascade Range average $500 per acre, while irrigated acres east of the mountains average $1,800.
- Poplar planting stock is produced by five companies and contracted out to growers.

Production Regions

Major production areas are located along the lower Columbia River in western Oregon and Washington, and near Hermiston, Oregon, and Wallula, Washington, on the east side of the Cascades. Acreage has also been planted in NW Washington and Oregon's Willamette Valley.



General Information

Most of the hybrid poplars currently grown in the Pacific Northwest are used for pulp to produce various paper products. They have also been used for production of lumber and plywood, fuel wood (wood-stove pellets), and to a lesser extent, conservation and ornamental plantings.

Hybrids are produced when plants of different species are cross-fertilized. Through vegetative propagation, selected individual clones can be preserved and reproduced indefinitely. Most of the commercial clones used in Washington and Oregon are hybrids between *Populus trichocarpa* and *P. deltoides* (TxD), hybrids between *P. deltoides* and *P. nigra* (DxN), hybrids between *P. trichocarpa* and *P. maximowiczii* (TxM), or hybrids between TxD hybrids and *P. maximowiczii* ((TxD)xM). Hybrids are selected for their vigor, adaptation to local environmental conditions and resistance to important pathogens.

Harvested poplars ready to be debarked and chipped.

Cultural Practices

Hybrid poplars are grown in a system known as short rotation intensive culture. In culture and harvesting, the system is more similar to agriculture than forestry. Success of the system depends on having good soil, appropriate cultural practices, and trees bred and selected specifically for high productivity. Hybrid poplars attain their best growth on deep, fertile, alluvial soils with adequate moisture. Hybrid poplars are grown for wood and fiber production on non-irrigated fields in western Washington and western Oregon and under irrigated systems (primarily drip) east of the Cascade Mountains in these two states.

Nursery production of rooted cuttings (foreground) and stool beds (background) for dormant cuttings.

Harvesting hybrid poplars

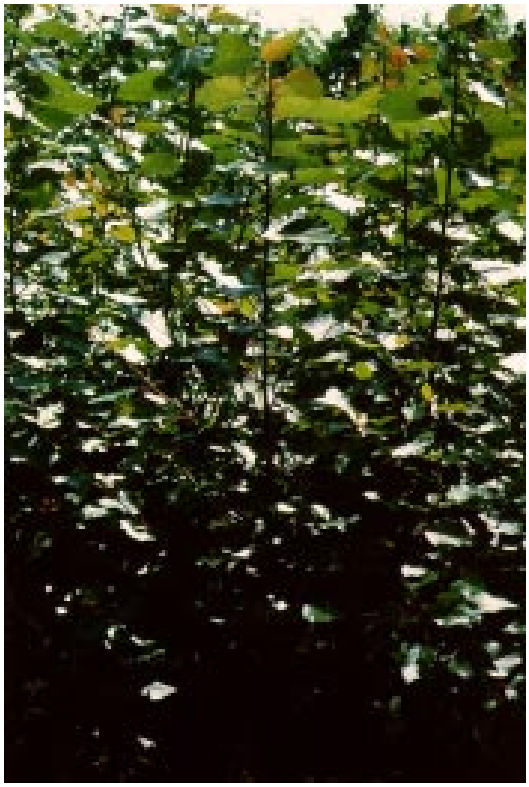
Hybrid poplar plantations are generally established using dormant hardwood cuttings. In eastern Washington cuttings are generally made in January and February from one-year-old shoots that are approximately 10 feet tall and 3/8 to 3/4 inches in diameter. The shoots are cut into 9-inch sections, each section having a viable bud in the top inch. Cuttings are packaged into 50 count bags, 10 bags to a case, and stored at 28°F until shipment. Shoots are taken from plants (stools) grown and maintained for production of cutting material. Blocks of such source material are referred to as stool beds.

Cuttings are planted in rows during late winter and early spring, with planting densities ranging from 273 to 870 trees per acre depending upon the intended harvest date. Lower density plantings allow for larger tree diameter where the bottom portions are

destined for the veneer or lumber market and the upper portions go to pulp production. Such plantations are typically harvested 15 years after planting. Higher density plantings are used primarily in the wood chip market, with harvest dates typically from 5 to 8 years after planting. In comparison, red alder requires 15 to 35 years and Douglas-fir needs 35 to 50 years of growth before they can be harvested.

Aerial view of hybrid poplar plantation consisting of several clones.

Several clones selected for superior growth at a particular location can show different branching patterns and competitive abilities from one to another that usually lead to uneven stand growth if planted together. Harvest costs make up 75% of the production costs of this crop, when the stands are even. Uneven stands not only drive the harvest costs up but can result in significant yield decreases. Thus, most plantations consist of planting blocks of single clones. To increase resistance management as well as minimize any environmental influences, different single-clone blocks are alternated in a "patchwork" arrangement within the plantation.



Production of plant material in stool beds for dormant cutting.

Hybrid Poplar Survey

During October 1998, a survey was mailed to five commercial companies that represent virtually all of the commercial production of hybrid poplars in the Pacific Northwest to obtain current information regarding their pest management practices. All of the companies responded to the survey. The following information is based on the responses to the survey. Very few pesticides are used to control insect and diseases on hybrid poplars. Excellent sources of host resistance are available in most instances. In other instances, the level of damage currently does not warrant the use of chemical treatment.

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Insect Pests

Poplar Willow Sawfly
Nematus salicis-oderatus

The poplar willow sawfly is one of the most important insect pests of hybrid poplars in western Oregon and Washington. The spotted larvae feed on leaves and can defoliate trees during the growing season. Typically, this insect completes three generations during the growing season. The extent of damage depends on the population of natural predators as well as the susceptibility of the clones that are being grown. Some TxD clones, such as 49-177, are very susceptible to this insect, while TxM or (TxD)xM clones appear to be fairly resistant. This insect causes damage in plantations near the coast every 3 to 4 years. Yield loss is estimated to be 10 to 15%.

Sawfly larvae damage on hybrid poplar leaf.

Cultural Control

Weeds must be controlled to reduce habitat for sawfly reproduction. Some clones are more prone to sawfly attack than others.

Poplar Leaf Beetle
Chrysomela scripta and *Glupisia septentrionis*

The poplar leaf beetle is a foliage feeder that can reduce tree vigor. Damage is done during the larval stage of the insect. *Chrysomela* produces multiple generations throughout the year, necessitating multiple applications of insecticide. *Glupisia* produces only one generation per year, therefore requiring only one insecticide application for control. Yield loss can range from 5 to 10%.

Chemical Control

Chrysomela: **Dimethoate** (Digon 400, 2-3 pints per acre) Applied by air. Multiple applications may be necessary during this period. Up to 56% of the total acres are treated annually.

Permethrin 2LB (Ambush, 6.4 ounces per acre) This 24c (WA-970028) pesticide is applied by air from April through September. Multiple applications may be necessary during this period. Up to 56% of the total acres are treated annually.

Glupisia: **Permethrin 2LB** (Ambush, 6.4 ounces per acre). This 24c (WA-970028) pesticide is applied by air during June. Less than 1% of the total acres are treated annually.

Satin Moth
Leucoma salicis

A leaf-feeding, brownish caterpillar with brown spots on its back. Damage by the larvae can be severe. Yield losses are unknown.

Chemical Control

Permethrin 2LB (Ambush, 6 -12 ounces per acre). This 24c (WA-970028) pesticide is applied by air during late summer. Up to 3% of the total acres are treated annually.

Aphids

Aphids are soft-bodied insects that suck juices from the leaves. Severe infestations on young trees can reduce growth. Extent of growth reduction is highly variable.

Chemical Control

Dimethoate (Digon 400, 2-3 pints per acre). Applied by chemigation. Multiple applications may be necessary during this period. Up to 20% of the total acres are treated annually.

Permethrin 2LB (Ambush, 6.4 ounces per acre). This 24c (WA-970028) pesticide is applied by air from April through September. Multiple applications may be necessary during this period. Up to 20% of the total acres are treated annually.

Willow Leaf Beetle
Phratora californica

The willow leaf beetle (a.k.a. imported willow leaf beetle) causes defoliation similar to that seen with the cottonwood leaf beetle. The small, oval, metallic blue to greenish-blue beetles feed on leaves starting in late April to May. The beetles often feed in clusters and feeding can continue through the growing season. The impact of the imported willow leaf beetle on the growth and productivity of hybrid poplars in western Washington and Oregon is uncertain at this time as is the susceptibility of particular clones.

Poplar Borer
Cryptorhynchus lapathi

Various borer species are present in the Pacific Northwest. Damage includes weakening and breaking of stems and degrading of bole wood quality. Control is difficult, but may be beneficial when high populations occur. Insect damage can open the door for secondary fungal infections and stain of heartwood.

Control

Has not been a major problem in plantations.

Lygus Bug or Tarnished Plant Bug
Lygus elisus

A small, brown, flying insect that can stunt height growth of young plants and cause malformed leaves and canker-like lesions on young stems. Damage to the plant is more from the toxins the insect injects in the plant while feeding than from the feeding activity. It is a problem once every 7 or 8 years. Damage to the trees can result in broken leaders during the first or second growing season. The trees recover from the damage during subsequent years. Yield loss is less than 5%.

Control

No control is necessary due to the limited amount of damage by the pest.

Eriophyid Mite
(undescribed species)

Eriophyid mites are also known as rust mites. Little information is available regarding the taxonomy of these mites, their biology and the impact they have on tree growth. In addition to the bronze discoloration of the underside of the leaf, these mites are also thought to cause leaf distortion or cupping.

Control

Aerial applications of Endosulfan 3 EC (24c WA-990025) are made to approximately 12% of the acreage at the rate of 2 qts/A in a minimum of 5 gallons of water/A. A maximum of two applications are made per year.

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Diseases

Aerial view of hybrid poplar plantation showing premature defoliation of a rust-susceptible clone (center) among rust-resistant clones.

Leaf Rust

Melampsora spp.

Leaf rust is the most important disease on hybrid poplars in the Pacific Northwest. The recently introduced *Melampsora medusae* f.sp. *deltoidae* is the most common *Melampsora* spp. on hybrid poplars, although *M. larici-populina* and *M. occidentalis* can also be found on certain clones. Initially, infections appear as yellow-orange pustules in early summer. The disease builds up rapidly during the growing season and can cause defoliation by late August or early September. High rust levels can also lead to a premature, fall budbreak or predispose trees to other diseases and to cold damage. These rust fungi overwinter on poplar leaves, infect alternate coniferous host (Douglas-fir, larch, pines, etc.) in spring, then spread back to the poplar host. Rust infections can result in death of susceptible clones in stool beds. Studies in the Pacific Northwest have shown that yields can be reduced by as much as 35% in plantations.

Yellow to orange colored masses of spores associated with leaf rust infection.

Cultural Control

The use of resistant clones is the principal method of controlling leaf rust. Races of the pathogen may develop which can overcome the resistance in some clones. Removal of coniferous hosts in the vicinity of hybrid poplar plantations will help reduce primary innoculum.

Chemical Control

Triadimefon (Bayleton 50% DF, 8 ounces per acre). This 24c (WA-930020) pesticide is applied by air during August. Up to 2% of the total acres are treated annually.

Septoria Leaf Spot

Septoria populicola

Septoria leaf spot favors cool, moist weather in the spring. Symptoms consist of circular leaf spots that are generally less than one half inch in diameter. High levels of disease result in premature defoliation. In general, native black cottonwood (*P. trichocarpa*) is susceptible to this disease, as are many TxM clones. TxD clones tend to be resistant. At this time, there is no indication that *S. musivae*, which causes a serious leaf spot and canker disease of poplars in the Midwest and eastern portions of North America, is present in the Pacific Northwest. The inadvertent introduction of this pathogen into our area would have a significant impact on the growth of many clones, which are very susceptible to this canker-causing pathogen.

Cultural Control

Use of resistant clones, sanitation of fallen leaves.

Differences in defoliation between clones that are resistant (right) and susceptible (left) to Venturia leaf blight.

Venturia Leaf and Shoot Blight
Venturia populina

Venturia leaf and shoot blight is probably the second most important disease of poplars in the western areas of Oregon and Washington. This disease favors cool, moist conditions and can result in the defoliation of susceptible clones during the spring. Symptoms initially appear as olive-green "V"-shaped areas of blighted tissue on the foliage. Blighted shoots appear as black shepherd's crooks and sometimes there are cankers on the small twigs and branches. TxD clones are the most susceptible, while TxM clones are resistant. Although growth impact information is not available from the Pacific Northwest, growth reductions of 30% have been reported from Italy.

Various symptoms associated with Venturia leaf blight.

Cultural Control

Use resistant clones. Preliminary data suggest that disease development and subsequent growth losses can potentially be reduced if susceptible clones are deployed in a polyclonal planting with resistant clones.

Stem canker associated with Venturia infection.

Marssonina Leaf Spot
Marssonina populi

Symptoms of this disease consist of leaf spots and petiole lesions that can reach epidemic proportions by late summer. This pathogen overwinters in fallen leaves and initially infects next year's growth in the spring. It has only been a problem on susceptible clones grown near the coast.

Symptoms associated with Marssonina leaf spot

Cultural Control

Use resistant clones. Destroy fallen leaves.

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Weeds

Weed control is an essential part of successful hybrid poplar production. It is necessary to eliminate most weeds and grasses in nursery stool beds. In plantations it is necessary to control weeds and grasses during the first two years of growth. Without control, the weeds create competition for nutrients, water, and light, resulting in stunted growth. Weeds also provide habitat for pests such as sawfly and voles. A site free of weeds is also necessary before a new crop is planted. Most of the herbicides used by growers are broad-spectrum herbicides. These are used to control a variety of broadleaf and grassy weeds. Specific weeds will be listed here only if they are a localized problem and the control method is host specific.

SITE PREPARATION

West-of-the-Cascades plantations usually treat the planting site initially with glyphosate to kill existing vegetation, then disk and sometimes rip the soil to prepare a fine seed bed. These preparations are made during summer and early fall, prior to planting. The site is often marked with ripped rows or raised beds to mark tree rows for planting.

Eastside plantations convert pivot irrigation to drip. The site is ripped deeply along each tree line to break up any agricultural hardpans, then each tree row has a band of herbicide tilled into it. Drip tubes are laid along the rip marks.

Chemical Control

Glyphosate 4LB (Roundup Ultra, Roundup Pro, 1 - 2 quarts per acre) plus

2,4-D Dimethylamine 3.8LB (various names, 0.24 lb. AI per acre) applied by ground sprayer during spring prior to planting. Up to 15% of the total plantation acres are treated annually before new plantings. Up to 80% yield loss if not controlled.

Trifluralin 4LB (Treflan MTF, 2 quarts per acre). Preplant use primarily when winter wheat is used as a cover crop before spring planting. Up to 3% of the total plantation acres are treated. Up to 80% yield loss if not treated.

PRE-PLANTING PREPARATION

Immediately before planting hybrid poplars, the tree rows are banded or broadcast sprayed with herbicide. The product used depends on the weed species present and grower selection. Different herbicide selections are made between east-side and west-side plantations depending upon soil type, climate, and other site characteristics such as soil moisture. Herbicides and other weed control measures are administered until the plantation closes canopy and natural shading begins to occur. Roundup, Oust, and 2,4-D can be very injurious to hybrid poplars when they are actively growing; some growers use shielded sprayers, but many use exclusively mechanical and manual means to control weeds during the growing season.

A combination of any of the following herbicides with Glyphosate may be used. Up to 9% of the total plantation acres may be treated annually with any of those listed below.

Chemical Control

Oxyfluorfen 1.6LB (Goal 1.6 E, 6 pints per acre)

Sulfometuron Methyl 75% (Oust, 0.3 to 0.5 ounces per acre) 24c, WA-950021.

Diuron 4LB (Drexel Diuron 4L or Karmex DF, 1.5 pounds per acre) 24c, WA-920023.

Terbacil 80% (Sinbar, 0.6 to 1.0 ounces per acre) 24c, WA-920024.

Glyphosate 4 LB (Roundup Ultra, Roundup Pro, 1 pint per acre)

Imazaquin 70% (Septer 70 DG, 2.8 to 5 ounces per acre)

All of these herbicides may be banded in tree rows as pre-emergent weed control. Up to 80% yield loss if not treated.

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POST PLANTING

Mechanical Control

Periodic tillage between tree rows approximately eight feet wide, within one foot of the trees less than four inches deep to minimize injury to the root system is common to control weeds during the first three years of growth. After this period, the poplars have established enough canopy cover to shade out the weeds, therefore reducing weed growth. Hand weeding is necessary to remove Horsetail or other problem weeds within the tree rows.

Chemical Control

Glyphosate 4LB (Roundup Ultra, Roundup Pro, 1 quart per acre) plus

2,4-D Dimethylamine 3.8LB (various names, 0.24 lb. AI per acre) applied by ground sprayer while trees are dormant during second year of growth. Up to 3% of the total acres are treated annually. Up to 40% yield loss if not treated.

Noxious Weeds

These weeds are very invasive and will choke out growth of other plants. The state of Washington either directly, or through the jurisdiction of county weed boards, requires control of noxious weeds by the landowner. Failure to control such weeds will result in civil penalties. The following are important chemical controls even though only a small percentage of acres are treated.

Canada Thistle
Cirsium arvense

A biennial noxious weed with an extensive root system from which plants are reproduced asexually. Plants are from 1 to 4 feet high with spiny tipped leaves and purple flowers that are 1/2 to 3/4 inches in diameter. It is very difficult to control with cultural or biological methods. Yield loss could be extensive if not controlled.

Chemical Control

Clopyralid (Stinger, 0.12–0.25 lb. AI per acre) applied by ground sprayer during the basal rosette to bud stage. Up to 2% of the total acres are treated annually.

Scotch Thistle
Onopordum acanthium

A biennial that grows up to 12 feet tall. Leaves are large and spiny and flowers are purple, measuring 1 to 2 inches in diameter. It is very aggressive and forms dense, impenetrable stands.

Chemical Control

2,4-D Dimethylamine 3.8LB (various names, 0.48 - 0.95 lb. AI per acre) applied by ground sprayer during the basal rosette stage. Less than 1% of the total acres are treated annually.

Yellow Starthistle
Centaurea solstitialis

An annual noxious weed that grows from 2 to 3 feet tall. It is armed with 3/4-inch long thorns and produces small yellow flowers. It readily outcompetes neighboring plants and quickly occupies unattended rangeland.

Chemical Control

Clopyralid (Stinger, 0.12–0.25 lb. AI per acre) plus **2,4-D** (2 to 3 pints per acre) applied during the basil rosette stage. Less than 1% of the total acres are treated annually.

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Animal Damage

Voles

Voles are small mammals that can cause extreme damage by girdling the bark on trees, resulting in tree death. Vole populations are cyclic, reaching epidemic size once every three to four years, although with proper conditions, vole damage can occur during any year of plantation development. Regular cultural control--timing and monitoring--can keep the problem in check and use of chemicals can be minimized to the years when the populations are high and the areas where damage occurs.

Cultural Control

Eliminate vegetative cover in and around the plantation. Wrap trees with foil or plastic or use Vexar tubes as physical barriers. Monitor vole populations within and adjacent to plantations to detect population buildup.

Chemical Control

Zinc phosphide 2% bait (zinc phosphide, 10 pounds per acre) This 24c (WA-950022) allows air application and is used in September during first year of growth. Up to 7% of the total acres are treated annually.

Deer and Elk

Controlled by fencing. Repellants have not proven very effective.

Beaver

Controlled by trapping.

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Use pesticides with care. Apply them only to plants, animals, or sites listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

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